

REMARKS

Claims 1-13, 22, and 27-48 are now pending. Claims 14-18 and 23-25 had been cancelled without prejudice. Claims 19-21 and 26 have been withdrawn from consideration. No claims stand allowed.

Claims 10 and 36 have been cancelled without prejudice by this amendment. Claims 9 and 35 have been amended to further particularly point out and distinctly claim subject matter regarded as the invention. The meaning of dependent claims 11-13, 37-43, and 45-48 is also changed because they depend from amended claims. New claims 49-64 have been added by this amendment and also particularly point out and distinctly claim subject matter regarded as the invention. The amendment also contains minor changes of a clerical nature. No "new matter" has been added by the amendment.

Rejections Under 35 U.S.C. § 103

A. The Examiner maintains the rejection to claims 1, 5, 6, 8, 22 and 30-34, which stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kitamura et al. (US Patent 5,904,912) in view of Stoll (US Patent 5,902,519). The rejection is respectfully traversed.

Claim 1 defines an annealing method including heating the lithium niobate structure in a sealed pure oxygen gas atmosphere substantially lacking in H₂O, and pressurizing the sealed pure oxygen gas atmosphere to exceed ambient atmospheric pressure. Similarly, claim 22 defines an annealing method including heating the lithium

tantalate structure in a sealed pure oxygen gas atmosphere substantially lacking in H₂O, and pressurizing the sealed pure oxygen gas atmosphere to exceed ambient atmospheric pressure.

As the Examiner has acknowledged in the final Office Action of 6/12/2001, “Kitamura does not disclose the step of pressurizing the sealed pure oxygen gas atmosphere to exceed ambient atmospheric pressure.” However, the Examiner relies on Stoll to provide the missing pressurizing process to be allegedly combined with Kitamura. Examiner also alleges, in the Advisory Action of 4/4/2002, that Kitamura suggest “a sealed atmosphere” as Kitamura uses the phrase “an atmosphere having a controlled oxygen partial pressure.”

In order to establish a prima facie case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings (MPEP §2143), as the applicant argued in the previdous response to the final Office Action.

Here, many examples of Kitamura use a flowing gas atmosphere, such as a 100% oxygen at a flow rate of 1 l/min., a dried 100% nitrogen gas at a flow rate of 1 l/min., a dried nitrogen gas containing 0.01% of oxygen at a flow rate of 1 l/min., and a nitrogen gas containing steam at a flow rate of 1 l/min (Column 11, lines 20-25), as pointed out in the previous response. Also, since “partial pressure” means “the pressure exerted by a

(specific) component in a mixture of gases” (Merriam-Webster’s Collegiate Dictionary, Electronic Edition, Version 1.1), the Kitamura’s language “an atmosphere having a controlled oxygen partial pressure” suggests that that atmosphere is not pure oxygen, and at most that the oxygen content in the dried nitrogen gas is controlled at 0.01% because there is no other mention to “partial pressure” in Kitamura, or other mixture gas containing oxygen. Furthermore, Kitamura strongly suggests a heat treatment in a “reducing” atmosphere, most preferably in a reducing atmosphere (or nitrogen) containing steam (i.e., containing H₂O vapor) (column 3, line 41, column 6, lines 55-59, column 9, lines 4-5) for the best performance. Kitamura’s suggestions of the flowing and reducing atmosphere teach away from combining a sealed and pressurized atmosphere which is contradicting Kitamura’s process.

Accordingly, one of ordinary skill in the art would not have combine Stoll’s pressurized oxygen to modify Kitamura’s process. It is respectfully requested that the rejection of claims based on Kitamura and Stoll be withdrawn.

Claims 2-8 and 44 depend directly or indirectly from claim 1, and claims 27-34 depend directly or indirectly from claim 22, and thus include the limitations of respective independent claims. The argument set forth above is equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

B. The Examiner maintains the rejection to claims 2-4, 9-13, 27-29 and 35-48, which stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kitamura in

view of Stoll and further in view of Young et al. (US Patent 5,095,518). The rejection is respectfully traversed.

The method recited in claim 9, as amended, includes locating a lithium niobate powder in a space proximate to the lithium niobate structure to retard outgassing of lithium oxide (Li_2O) from the lithium niobate structure; and separating the space including the lithium niobate powder from the lithium niobate structure with an interface porous to lithium oxide gas outgassed from the lithium niobate powder, the interface being substantially without porosity to the lithium niobate powder. Claim 35, as amended, recites a method for annealing a lithium tantalate structure including the similar distinguish features as claim 9.

Young discloses a thin sheet **48** placed on the top surface of the lithium niobate powder **46** so as to isolate the substrate **10** from the direct contact with the powder **46** (column 4, line 66 to column 5, line 2). That is, as shown in FIG. 5 of Young, the sheet **48** prevents only "direct contact" of the substrate **10** with the powder **46**, but the substrate **10** is placed in the same space that contains the powder **46**. Thus, Young does not teach separating the space including the powder from the substrate, as claimed. Furthermore, as shown in FIG. 5, the lithium oxide gas directly comes from the surface of the powder **46** not covered by the sheet **48** so as to reach the substrate **10**, and thus the sheet **48** need not be porous to lithium oxide gas. Therefore, Young does not teach or suggest an interface porous only to lithium oxide gas but not to the lithium oxide powder.


Accordingly, even if Young's teachings might be combined to Kitamura and Stoll, such a combination would not yield the claimed invention. It is respectfully requested that the rejection of claims based on Kitamura, Stoll and Young be withdrawn.

Claims 12-13 and 45-48 depend from claim 9, and claims 37-43 depend from claim 35, and thus include the limitations of the corresponding independent claims. The argument set forth above is equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

In view of the foregoing, consideration and an early allowance of this application are earnestly solicited.

Respectfully submitted,
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Marked-Up Version of Claims Showing Changes Made

2. (Twice Amended) The method of claim 1 wherein said heating [act further] comprises:

locating a lithium niobate powder proximate to the lithium niobate structure to retard outgassing of lithium oxide (Li_2O) from the lithium niobate structure.

3. (Twice Amended) The method of claim 2 wherein said heating [the locating act] further comprises:

separating the lithium niobate powder from the lithium niobate structure with an interface porous to lithium oxide gas outgassed from the lithium niobate powder and the interface substantially without porosity to the lithium niobate powder.

6. (Twice Amended) The method of claim 1 wherein said heating is within a temperature range of about 150 [300] degrees Celsius to about 900 [1000] degrees Celsius.

9. (Twice Amended) A method for annealing a lithium niobate (LiNbO_3) structure, the method comprising:

locating a lithium niobate powder in a space proximate to the lithium niobate structure to retard outgassing of lithium oxide (Li_2O) from the lithium niobate structure;

separating the space including the lithium niobate powder from the lithium niobate structure with an interface porous to lithium oxide gas outgassed from the lithium

niobate powder, the interface being substantially without porosity to the lithium niobate powder;

heating the lithium niobate structure and the lithium niobate powder in a sealed oxygen gas (O₂) atmosphere;

pressurizing the sealed oxygen gas atmosphere to a pressure above ambient atmospheric pressure;

maintaining temperature and pressure for an anneal period; and

cooling to room temperature.

11. (Twice Amended) The method of claim 9 [10] wherein the interface includes a porosity of approximately 20 microns.

12. (Twice Amended) The method of claim 9 wherein the [with a] sealed pure oxygen gas atmosphere substantially lacks [lacking] in H₂O.

22. (Twice Amended) A method for annealing a lithium tantalate (LiTaO₃) structure, the method comprising:

heating a lithium tantalate structure in a sealed pure oxygen gas (O₂) atmosphere substantially lacking in H₂O; [H₂O]

pressurizing the sealed pure oxygen gas atmosphere to exceed ambient atmospheric pressure;

maintaining temperature and pressure for an anneal period; and

cooling to room temperature.

27. (Once Amended) The method of claim 22 wherein said heating [the heating act] further comprises:

locating a lithium tantalate powder proximate to the lithium tantalate structure to retard outgassing of lithium oxide (Li_2O) from the lithium tantalate structure.

28. (Once Amended) The method of claim 27 [22] wherein said heating [the locating act] further comprises:

separating the lithium tantalate powder from the lithium tantalate structure with an interface porous to lithium oxide gas outgassed from the lithium tantalate powder and the interface substantially without porosity to the lithium tantalate powder.

29. (Once Amended) The method of claim 28 [22] wherein the interface includes a porosity of approximately 20 microns.

30. (Once Amended) The method of claim 22 wherein said heating is within a temperature range of about 150 [300] degrees Celsius to about 900 [1000] degrees Celsius.

34. (Once Amended) The method of claim 22 wherein, wherein the lithium tantalate structure includes at least one of[:] an optical modulator and an optical waveguide.

35. (Once Amended) A method for annealing a lithium tantalate (LiTaO_3) structure, the method comprising:

locating a lithium tantalate powder in a space proximate to the lithium tantalate structure to retard outgassing of lithium oxide (Li_2O) from the lithium tantalate structure;

separating the space including the lithium tantalate powder from the lithium tantalate structure with an interface porous to lithium oxide gas outgassed from the lithium tantalate powder and the interface substantially without porosity to the lithium tantalate powder;

heating the lithium tantalate structure and the lithium tantalate powder in a sealed oxygen gas (O_2) atmosphere;

pressurizing the sealed oxygen gas atmosphere to a pressure above ambient atmospheric pressure;

maintaining temperature and pressure for an anneal period; and

cooling to room temperature.

37. (Once Amended) The method of claim 35 [36] wherein the interface includes a porosity of approximately 20 microns.

39. (Once Amended) The method of claim 35 wherein said heating is within a temperature range of about 150 [300] degrees Celsius to about 900 [1000] degrees Celsius.

43. (Once Amended) The method of claim 35 wherein the lithium tantalate structure includes at least one of[:] an optical modulator and an optical waveguide.

44. (Once Amended) The method of claim 1 wherein the lithium niobate structure includes at least one of[:] an optical modulator and an optical waveguide.

45. (Once Amended) The method of claim 9 wherein said heating is within a temperature range of about 150 [300] degrees Celsius to about 900 [1000] degrees Celsius.

48. (Once Amended) The method of claim 9 wherein the lithium niobate structure includes at least one of[:] an optical modulator and an optical waveguide.

49. (New) The method of claim 6 wherein said heating is within a temperature range of about 150 degrees Celsius to about 600 degrees Celsius.

50. (New) The method of claim 49 wherein said heating is within a temperature range of about 300 degrees Celsius to about 400 degrees Celsius.

51. (New) The method of claim 30 wherein said heating is within a temperature range of about 150 degrees Celsius to about 600 degrees Celsius.

52. (New) The method of claim 51 wherein said heating is within a temperature range of about 300 degrees Celsius to about 400 degrees Celsius.
53. (New) The method of claim 39 wherein said heating is within a temperature range of about 150 degrees Celsius to about 600 degrees Celsius.
54. (New) The method of claim 53 wherein said heating is within a temperature range of about 300 degrees Celsius to about 400 degrees Celsius.
55. (New) The method of claim 45 wherein said heating is within a temperature range of about 150 degrees Celsius to about 600 degrees Celsius.
56. (New) The method of claim 55 wherein said heating is within a temperature range of about 300 degrees Celsius to about 400 degrees Celsius.
57. (New) A method for annealing a lithium niobate (LiNbO_3) structure, the method comprising:
- heating the lithium niobate structure in a sealed oxygen gas (O_2) atmosphere substantially lacking in H_2O to within a temperature range of about 150 degrees Celsius to about 500 degrees Celsius;
 - pressurizing the sealed oxygen gas atmosphere to exceed ambient atmospheric pressure;

maintaining temperature and pressure for an anneal period; and
cooling to room temperature.

58. (New) The method of claim 57 wherein said heating is within a temperature range of about 150 degrees Celsius to about 400 degrees Celsius.

59. (New) The method of claim 57 wherein said heating is within a temperature range of about 300 degrees Celsius to about 400 degrees Celsius.

60. (New) The method of claim 57 wherein said heating is performed at a temperature about 300 degrees Celsius.

61. (New) A method for annealing a lithium tantalate (LiTaO_3) structure, the method comprising:

heating a lithium tantalate structure in a sealed oxygen gas (O_2) atmosphere substantially lacking in H_2O to a temperature range of about 150 degrees Celsius to about 500 degrees Celsius;

pressurizing the sealed oxygen gas atmosphere to exceed ambient atmospheric pressure;

maintaining temperature and pressure for an anneal period; and
cooling to room temperature.

62. (New) The method of claim 61 wherein said heating is within a temperature range of about 150 degrees Celsius to about 400 degrees Celsius.

63. (New) The method of claim 61 wherein said heating is within a temperature range of about 300 degrees Celsius to about 400 degrees Celsius.

64. (New) The method of claim 61 wherein said heating is performed at a temperature about 300 degrees Celsius.